UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,581	04/14/2004	Arie Ben-Bassat	CL2371 USNA	7161

23906 7590 12/05/2006

E I DU PONT DE NEMOURS AND COMPANY
LEGAL PATENT RECORDS CENTER
BARLEY MILL PLAZA 25/1128
4417 LANCASTER PIKE
WILMINGTON, DE 19805

EXAMINER	
RAMIREZ, DELIA M	
ART UNIT	**PAPER NUMBER**
1652	

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/824,581	BEN-BASSAT ET AL.	
	Examiner	Art Unit	
	Delia M. Ramirez	1652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14,17-19,25,29 and 38-40* is/are rejected.

7)☒ Claim(s) *15,16,20-24,26-28 and 30-37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/11/05,7/12/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *alignment*

DETAILED ACTION

Status of the Application

Claims 1-40 are pending.

Applicant's election without traverse of Group II, claims 1-40 drawn to a process for producing para-hydroxystyrene with a polypeptide comprising SEQ ID NO: 4, as submitted in a communication filed on 9/25/2006 is acknowledged.

It is noted that there no claim 28 has been presented. Thus, in accordance with 37 CFR 1.126, claims 1-41 have been renumbered 1-40. For example, previous claim 29 is now claim 28, previous claim 30 is now claim 29, etc. Applicant is requested to use the new numbering of the claims in future communications. Also, please note that the claim numbers used in this Office action reflect the renumbering of the claims.

Claims 1-40 are at issue and are being examined herein.

Priority

1. Acknowledgment is made of a claim for domestic priority under 35 U.S.C. 119(e) to provisional application No. 60/462827 filed on 4/14/2003, and 60/547170 filed on 2/24/2004.

2. Applicant's amendment of the first paragraph of the specification, as filed on 9/25/2006, claiming priority to 60/547170 filed on 2/24/2004 is acknowledged.

Information Disclosure Statement

3. The information disclosure statements (IDS) submitted on 10/11/2005 and 7/12/2004 are acknowledged. The submissions are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Claim Rejections - 35 USC § 112, Second Paragraph

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 7, 17-19, 25, 29, 38-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claims 7 and 29 are indefinite in the recitation of "cell selected from the group consisting of soybean, rapeseed, pepper.....and forage grasses" because the items to select from are not cells but vegetables/fruits/plants. For examination purposes, it will be assumed that the claims refer to cells from those items. Correction is required.

7. Claims 17-19 and 39-40 are indefinite in the recitation of "a process according claim 1/20 wherein the para-hydroxystyrene is chemically derivatized in the extractant to form a derivatized compound" for the following reasons. While the preamble in claims 1 and 20 refer to a process for producing para-hydroxystyrene, claims 17-19 and 38-40 are drawn to a process for producing a derivative of para-hydroxystyrene. Thus, the product to be made by the process of claims 1 and 20 is not the same as that of claims 17-19 and 38-40. For examination purposes, it will be assumed that claims 17 and 38 are independent claims directed to a method of producing derivatives of para-hydroxystyrene which incorporate the steps of claims 1 and 20. Correction is required.

8. Claim 25 is indefinite in the recitation of "wherein the wildtype host cell is selected form the group consisting of *Lactobacillus plantarum*.." for the following reasons. The wildtype host cell being referred to is the source of the enzyme of SEQ ID NO: 4. According to the specification, the enzyme of SEQ ID NO: 4 is a *B. subtilis* enzyme and not a *Lactobacillus plantarum* enzyme. For examination purposes, no patentable weight will be given to the term "*Lactobacillus plantarum*". Correction is required.

9. Claim 38 is indefinite in the recitation of "wherein the fermentation medium after step (c) is optionally added back to the biphasic reaction medium" for the following reasons. Step (c) in claim 20 requires contacting the fermentation medium with the enzyme source and extraction of the product (para-hydroxystyrene) into the extractant. Step (c) does not require separating the extractant from the fermentation medium. Separation of the two phases occurs in step (d). Thus, the limitation recited in claim 38 is unclear and confusing because the fermentation medium is still part of the reaction mixture after step (c). Only after separation of the phases has occurred, one can recycle the fermentation medium. For examination purposes, it will be assumed that the claim recites "wherein the fermentation medium after step (d) is optionally added back to the biphasic reaction medium". Correction is required.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 1-3, 8-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cavin et al. (Applied and Environmental Microbiology 64(4):1466-1471, 1998) in view of Lee et al. (Enzyme and

Microbial Technology 23:261-266, 1998; cited in the IDS and the specification). Cavin et al. teach the purification and characterization of the *B. subtilis* decarboxylase of SEQ ID NO: 4 of the instant application. Cavin et al. teach that the decarboxylase of SEQ ID NO: 4 uses p-coumaric acid (also known as para-hydroxycinnamic acid), ferulic acid and caffeic acid as substrates (Abstract; Table 1). Decarboxylation of p-coumaric acid would produce para-hydroxystyrene. Cavin et al. uses *B. subtilis* crude cell extracts for enzymatic characterization of the enzyme (Table 1). Cavin et al. does not teach production of para-hydroxystyrene in a biphasic medium. Lee et al. teach decarboxylation of ferulic acid to 4-vinylguaiacol by whole cells of *B. pumilus* that produce a ferulate decarboxylate in an aqueous/organic solvent two-phase system (Abstract). Lee et al. also teach the partition coefficient of ferulic acid and 4-vinylguaiacol in various solvents including hexane (Table 1), the enzymatic activity of the decarboxylase contained in whole *B. pumilus* cells using different solvents including hexane (Table 2), the use of a fedbatch aqueous-organic two phase system to avoid ferulic acid substrate inhibition (page 264, right column), the separation of the phases by centrifugation, isolation of 4-vinylguaiacol by HPLC using a Hypersil C18 resin (page 262, Analytical Methods), and cell harvest by centrifugation (page 262, right column, second full paragraph). Lee et al. teach that the best results were obtained with a two-phase system containing equal volumes (50%/50%) of hexane and phosphate buffer (page 264, left column, second full paragraph). Lee et al. do not teach the production of para-hydroxystyrene or the decarboxylase of SEQ ID NO: 4.

Claims 1-3 are directed in part to a method for producing para-hydroxystyrene by providing an enzyme source containing the decarboxylase of SEQ ID NO: 4, wherein said enzyme is contacted with para-hydroxycinnamic acid in a biphasic reaction medium (aqueous/organic solvent), wherein said biphasic reaction medium contains hexane as the organic solvent phase, and wherein said enzyme source is the purified enzyme or a wildtype *B. subtilis* cells. Claims 9-10 are directed in part to the method of claim 1 with the added limitation that the extractant (organic phase) is present in the biphasic medium in

an amount from 20% to 50% by volume. Claim 8 is directed to the method of claim 1 with the added limitation that the enzyme source is immobilized. Claim 11 is directed in part to the method of claim 1 with the added limitation that the organic phase (extractant) is separated from the aqueous phase by centrifugation. Claims 12-13 are directed in part to the method of claim 1 wherein the enzyme source is recovered from the aqueous phase by centrifugation or filtration. Claim 14 is directed in part to the method of claim 1 wherein para-hydroxystyrene is recovered by adsorption by resins.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce para-hydroxystyrene, which is a derivative of 4-vinylguaiacol, using the method described by Lee et al., wherein the enzyme source is immobilized and/or the enzyme source is recovered by centrifugation or filtration, and wherein para-hydroxystyrene is recovered by adsorption by resins (e.g., HPLC). A person of ordinary skill in the art is motivated to produce para-hydroxystyrene in a biphasic medium for the benefit of avoiding substrate and product inhibition, as taught by Lee et al. with regard to a similar decarboxylase from *B. pumilus* (page 262, left column, lines 2-3, first full paragraph). In the absence of evidence to the contrary, one of skill in the art would expect the decarboxylase of Cavin et al. to also experience substrate and product inhibition. Also, one of skill in the art is motivated to immobilize the enzyme source as immobilization allows for recovery of the enzyme, lower operation costs as enzyme loss is less likely, and potential enzyme stability. There is motivation to recover the enzyme source by centrifugation/filtration as these are easy methods to separate solids from liquids which are well known in the art and also taught by Lee et al. Similarly, there is motivation to use HPLC to isolate para-hydroxystyrene as this is a well known separation method used to isolate a close derivative of para-hydroxystyrene. One of ordinary skill in the art has a reasonable expectation of success at producing para-hydroxystyrene using the method described by Lee et al. for 4-vinylguaiacol with the enzyme of Cavin et al. and para-hydroxycinnamic acid as the substrate in view of the fact that Cavin discloses the enzyme which catalyzes the decarboxylation of para-hydroxycinnamic acid and Lee et al. teach the

successful use of a biphasic medium with hexane for 4-vinylguaiacol, which is a structurally close derivative of para-hydroxystyrene. Furthermore, one of skill in the art has a reasonable expectation of success at immobilizing the enzyme and/or recover the enzyme source by centrifugation or filtration in view of the fact that (1) enzyme/whole cell immobilization is well-known in the art, as admitted by Applicant (page 20, lines 8-26), and (2) centrifugation/filtration are well known methods of separation. There is a reasonable expectation of success at isolating para-hydroxystyrene by HPLC as a closely related derivative was successfully separated by HPLC. Therefore, the invention as a whole would have been prima facie obvious to a person of ordinary skill in the art at the time the invention was made.

Double Patenting

13. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

14. Claims 1-2, 4-14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14, 17-19 of copending Application No. 10/439478 in view of Lee et al. (Enzyme and Microbial Technology 23:261-266, 1998; cited in the IDS and the specification). Although the conflicting claims are not identical, they are not patentably distinct from each other for the following reasons.

Claims 1-14, 17-19 of U.S. Application No. 10/439478 are directed in part to a method for the production of para-hydroxystyrene, wherein said method requires cultivation of specific bacterial, yeast, fungi, and plant recombinant cells, wherein said recombinant cells comprise at least one gene encoding a polypeptide having para-hydroxycinnamic acid decarboxylase activity, wherein said polypeptide comprises SEQ ID NO: 4 of the instant application (SEQ ID NO: 6 in U.S. Application No. 10/439478), and wherein said cells further comprise at least one gene encoding a polypeptide having tyrosine/phenylalanine ammonia lyase activity and cinnamate 4-hydroxylase activity. The specification of U.S. Application No. 10/439478 does not contemplate the claimed method to be practiced in a biphasic medium.

Lee et al. teach decarboxylation of ferulic acid to 4-vinylguaiacol by whole cells of *B. pumilus* that produce a ferulate decarboxylate in an aqueous/organic solvent two-phase system (Abstract). Lee et al. also teach the partition coefficient of ferulic acid and 4-vinylguaiacol in various solvents including hexane (Table 1), the enzymatic activity of the decarboxylase contained in whole *B. pumilus* cells using different solvents including hexane (Table 2), the use of a fedbatch aqueous-organic two phase system to avoid ferulic acid substrate inhibition (page 264, right column), the separation of the phases by centrifugation, isolation of 4-vinylguaiacol by HPLC using a Hypersil C18 resin (page 262, Analytical Methods), and cell harvest by centrifugation (page 262, right column, second full paragraph). Lee et al. teach that the best results were obtained with a two-phase system containing equal volumes (50%/50%) of hexane and phosphate buffer (page 264, left column, second full paragraph). Lee et al. do not teach the production of para-hydroxystyrene or the decarboxylase of SEQ ID NO: 4.

Claims 1-2 are directed in part to a method for producing para-hydroxystyrene by providing an enzyme source containing the decarboxylase of SEQ ID NO: 4, wherein said enzyme source is contacted with para-hydroxycinnamic acid in a biphasic reaction medium (aqueous/organic solvent), wherein said biphasic reaction medium contains hexane as the organic solvent phase, and wherein said enzyme source

is a recombinant cell that produces the decarboxylase of SEQ ID NO: 4. Claims 4-7 are directed to the method of claim 1 wherein the recombinant host cell is a particular type of bacterial cell, yeast cell, or plant cell. Claim 8 is directed to the method of claim 1 with the added limitation that the enzyme source is immobilized. Claims 9-10 are directed in part to the method of claim 1 with the added limitation that the extractant (organic phase) is present in the biphasic medium in an amount from 20% to 50% by volume. Claim 11 is directed in part to the method of claim 1 with the added limitation that the organic phase (extractant) is separated from the aqueous phase by centrifugation. Claims 12-13 are directed in part to the method of claim 1 wherein the enzyme source is recovered from the aqueous phase by centrifugation or filtration. Claim 14 is directed in part to the method of claim 1 wherein para-hydroxystyrene is recovered by adsorption by resins.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce para-hydroxystyrene, which is a derivative of 4-vinylguaiacol, using the method described by Lee et al., wherein the enzyme source is immobilized and/or the enzyme source is recovered by centrifugation or filtration, and wherein para-hydroxystyrene is recovered by adsorption by resins (e.g., HPLC). A person of ordinary skill in the art is motivated to produce para-hydroxystyrene in a biphasic medium for the benefit of avoiding substrate and product inhibition, as taught by Lee et al. with regard to a similar decarboxylase from *B. pumilus* (page 262, left column, lines 2-3, first full paragraph). In the absence of evidence to the contrary, one of skill in the art would expect the decarboxylase of SEQ ID NO: 4 to also experience substrate and product inhibition. Also, one of skill in the art is motivated to immobilize the enzyme source as immobilization allows for recovery of the enzyme, lower operation costs as enzyme loss is less likely, and potential enzyme stability. There is motivation to recover the enzyme source by centrifugation/filtration as these are easy methods to separate solids from liquids which are well known in the art and also taught by Lee et al. Similarly, there is motivation to use HPLC to isolate para-hydroxystyrene as this is a well known separation method used to isolate a close derivative of

para-hydroxystyrene. One of ordinary skill in the art has a reasonable expectation of success at producing para-hydroxystyrene using the method described by Lee et al. for 4-vinylguaiacol with the polypeptide of SEQ ID NO: 4 and para-hydroxycinnamic acid as the substrate in view of the fact that Lee et al. teach the successful use of a biphasic medium with hexane for 4-vinylguaiacol, which is a structurally close derivative of para-hydroxystyrene. Furthermore, one of skill in the art has a reasonable expectation of success at immobilizing the enzyme and/or recover the enzyme source by centrifugation or filtration in view of the fact that (1) enzyme/whole cell immobilization is well-known in the art, as admitted by Applicant (page 20, lines 8-26), and (2) centrifugation/filtration are well known methods of separation. There is a reasonable expectation of success at isolating para-hydroxystyrene by HPLC as a closely related derivative was successfully separated by HPLC. Therefore, the invention of claims 1-14, 17-19 of copending Application No. 10/439478 in view of Lee et al. render the invention of claims 1-2, 4-14 of the instant application obvious to one of ordinary skill I the art.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PMR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Delia M. Ramirez whose telephone number is (571) 272-0938. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Ponnathapura Achutamurthy can be reached on (571)

272-0928. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1600.

Delia M. Ramirez, Ph.D.
Patent Examiner
Art Unit 1652

DR
November 17, 2006

16	488	55.3	107	2	Q9KHJ0_LACPA	Q9khj0 lactobacill
17	474	53.7	108	2	Q9KHI9_LACPE	Q9khi9 lactobacill
18	467	52.9	107	2	Q9KHI6_LACBR	Q9khi6 lactobacill
19	464	52.6	109	2	Q9KHJ1_9LACO	Q9khj1 lactobacill
20	461	52.3	169	2	Q6DB32_ERWCT	Q6db32 erwinia car
21	419	47.5	174	1	PADC_VIBCH	Q9kpx2 vibrio chol
22	329	37.3	95	2	Q9KHJ2_LACHI	Q9khj2 lactobacill
23	189	21.4	39	2	Q9R4C1_BACPU	Q9r4c1 bacillus pu
24	172.5	19.6	38	2	Q9R4W3_PSEFL	Q9r4w3 pseudomonas
25	138	15.6	176	2	Q4IH86_GIBZE	Q4ih86 gibberella
26	115	13.0	172	2	Q2U7L8_ASPOR	Q2u718 aspergillus
27	112.5	12.8	175	2	Q4P8S8_USTMA	Q4p8s8 ustilago ma
28	94	10.7	681	2	Q43KC0_9CHLB	Q43kc0 chlorobium
29	92	10.4	866	2	Q6FSX2_CANGA	Q6fsx2 candida gla
30	92	10.4	1504	2	Q6B961_CANGA	Q6b961 candida gla
31	91.5	10.4	1574	1	RPOC_AQUAE	O67763 aquifex aeo
32	86.5	9.8	312	2	Q9AGX3_VIBCH	Q9agx3 vibrio chol
33	86.5	9.8	1588	2	Q50SL7_ENTHI	Q50sl7 entamoeba h
34	85	9.6	379	2	Q8THT9_METAC	Q8tht9 methanosarc
35	85	9.6	540	2	Q6BIU2_DEBHA	Q6biu2 debaryomyce
36	84.5	9.6	462	2	Q32LT4_BRARE	Q32lt4 brachydanio
37	84.5	9.6	527	2	Q6F0T4_MESFL	Q6f0t4 mesoplasma
38	84.5	9.6	1044	2	Q5KYP9_GEOKA	Q5kyp9 geobacillus
39	84	9.5	379	2	Q46DI3_METBA	Q46di3 methanosarc
40	84	9.5	400	2	Q4ER00_LISMO	Q4er00 listeria mo
41	83.5	9.5	196	2	Q537Q2_9BRYO	Q537q2 pyrrhobryum
42	83.5	9.5	350	2	Q5T089_HUMAN	Q5t089 homo sapien
43	83.5	9.5	350	2	Q8WW30_HUMAN	Q8ww30 homo sapien
44	83.5	9.5	366	2	Q50R13_ENTHI	Q50r13 entamoeba h
45	83.5	9.5	497	2	Q9H852_HUMAN	Q9h852 homo sapien

ALIGNMENTS

```
RESULT 1
PADC_BACSU
ID   PADC_BACSU     STANDARD;      PRT;   161 AA.
AC   O07006;
DT   10-OCT-2002, integrated into UniProtKB/Swiss-Prot.
DT   01-JUL-1997, sequence version 1.
DT   07-MAR-2006, entry version 37.
DE   Phenolic acid decarboxylase (EC 4.1.1.-) (PAD).
GN   Name=padC; Synonyms=pad; OrderedLocusNames=BSU34400;
OS   Bacillus subtilis.
OC   Bacteria; Firmicutes; Bacillales; Bacillaceae; Bacillus.
OX   NCBI_TaxID=1423;
RN   [1]
RP   NUCLEOTIDE SEQUENCE [GENOMIC DNA], AND CHARACTERIZATION.
RC   STRAIN=168;
RX   MEDLINE=98207851; PubMed=9546183;
RA   Cavin J.-F., Dartois V., Divies C.;
RT   "Gene cloning, transcriptional analysis, purification, and
RT   characterization of phenolic acid decarboxylase from Bacillus
RT   subtilis.";
RL   Appl. Environ. Microbiol. 64:1466-1471(1998).
RN   [2]
RP   NUCLEOTIDE SEQUENCE [GENOMIC DNA].
RC   STRAIN=168;
RA   Denizot F.;
RL   Submitted (APR-1997) to the EMBL/GenBank/DDBJ databases.
RN   [3]
RP   NUCLEOTIDE SEQUENCE [LARGE SCALE GENOMIC DNA].
RC   STRAIN=168;
RX   MEDLINE=98044033; PubMed=9384377; DOI=10.1038/36786;
RA   Kunst F., Ogasawara N., Moszer I., Albertini A.M., Alloni G.,
RA   Azevedo V., Bertero M.G., Bessieres P., Bolotin A., Borchert S.,
RA   Borriss R., Boursier L., Brans A., Braun M., Brignell S.C., Bron S.,
RA   Brouillet S., Bruschi C.V., Caldwell B., Capuano V., Carter N.M.,
RA   Choi S.-K., Codani J.-J., Connerton I.F., Cummings N.J., Daniel R.A.,
RA   Denizot F., Devine K.M., Duesterhoeft A., Ehrlich S.D., Emmerson P.T.,
RA   Entian K.-D., Errington J., Fabret C., Ferrari E., Foulger D.,
RA   Fritz C., Fujita M., Fujita Y., Fuma S., Galizzi A., Galleron N.,
RA   Ghim S.-Y., Glaser P., Goffeau A., Golightly E.J., Grandi G.,
RA   Guiseppi G., Guy B.J., Haga K., Haiech J., Harwood C.R., Henaut A.,
RA   Hilbert H., Holsappel S., Hosono S., Hullo M.-F., Itaya M.,
RA   Jones L.-M., Joris B., Karamata D., Kasahara Y., Klaerr-Blanchard M.,
RA   Klein C., Kobayashi Y., Koetter P., Koningstein G., Krogh S.,
RA   Kumano M., Kurita K., Lapidus A., Lardinois S., Lauber J.,
RA   Lazarevic V., Lee S.-M., Levine A., Liu H., Masuda S., Mauel C.,
RA   Medigue C., Medina N., Mellado R.P., Mizuno M., Moestl D., Nakai S.,
RA   Noback M., Noone D., O'Reilly M., Ogawa K., Ogiwara A., Oudega B.,
RA   Park S.-H., Parro V., Pohl T.M., Portetelle D., Porwollik S.,
RA   Prescott A.M., Presecan E., Pujic P., Purnelle B., Rapoport G.,
RA   Rey M., Reynolds S., Rieger M., Rivolta C., Rocha E., Roche B.,
RA   Rose M., Sadaie Y., Sato T., Scanlan E., Schleich S., Schroeter R.,
RA   Scoffone F., Sekiguchi J., Sekowska A., Seror S.J., Serror P.,
RA   Shin B.-S., Soldo B., Sorokin A., Tacconi E., Takagi T., Takahashi H.,
RA   Takemaru K., Takeuchi M., Tamakoshi A., Tanaka T., Terpstra P.,
RA   Tognoni A., Tosato V., Uchiyama S., Vandenbol M., Vannier F.,
RA   Vassarotti A., Viari A., Wambutt R., Wedler E., Wedler H.,
RA   Weitzenegger T., Winters P., Wipat A., Yamamoto H., Yamane K.,
RA   Yasumoto K., Yata K., Yoshida K., Yoshikawa H.-F., Zumstein E.,
RA   Yoshikawa H., Danchin A.;
RT   "The complete genome sequence of the Gram-positive bacterium Bacillus
RT   subtilis.";
RL   Nature 390:249-256(1997).
CC   -!- FUNCTION: Catalyzes the decarboxylation of phenolic acids such as
CC       ferulic, p-coumaric and caffeic acids.
CC   -!- BIOPHYSICOCHEMICAL PROPERTIES:
CC       pH dependence:
CC         Optimum pH is 5.0;
CC       Temperature dependence:
CC         Optimum temperature is 40-45 degrees Celsius;
CC   -!- SUBUNIT: Homodimer (Probable).
CC   -!- INDUCTION: By ferulic, p-coumaric and caffeic acids. Cells
CC       extracts from caffeic acid-induced cells exhibited lower activity
CC       on the three acids, which indicates that caffeic acid could be a
CC       less efficient inducer.
CC   -!- SIMILARITY: Belongs to the padC family.
CC   ---------------------------------------------------------------------
CC   Copyrighted by the UniProt Consortium, see http://www.uniprot.org/terms
CC   Distributed under the Creative Commons Attribution-NoDerivs License
CC   ---------------------------------------------------------------------
```

```
DR   EMBL; AF017117; AAC46254.1; -; Genomic_DNA.
DR   EMBL; Z94043; CAB08020.1; -; Genomic_DNA.
DR   EMBL; Z99121; CAB15445.1; -; Genomic_DNA.
DR   PIR; D69671; D69671.
DR   GenomeReviews; AL009126_GR; BSU34400.
DR   SubtiList; BG12433; padC.
DR   BioCyc; BSUB1423:BSU3437-MONOMER; -.
DR   InterPro; IPR008729; PA_decarbox.
DR   Pfam; PF05870; PA_decarbox; 1.
DR   PIRSF; PIRSF011561; PAD; 1.
DR   ProDom; PD022010; PA_decarbox; 1.
KW   Complete proteome; Decarboxylase; Lyase.
FT   CHAIN         1    161       Phenolic acid decarboxylase.
FT                                /FTId=PRO_0000108125.
SQ   SEQUENCE   161 AA;  19077 MW;  BAF73F679D0FC313 CRC64;

  Query Match             100.0%;  Score 882;  DB 1;  Length 161;
  Best Local Similarity   100.0%;  Pred. No. 1.8e-70;
  Matches  161;  Conservative    0;  Mismatches    0;  Indels    0;  Gaps    0;

Qy          1 MENFIGSHMIYTYENGWEYEIYIKNDHTIDYRIHSGMVAGRWVRDQEVNIVKLTEGVYKV 60
              ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Db          1 MENFIGSHMIYTYENGWEYEIYIKNDHTIDYRIHSGMVAGRWVRDQEVNIVKLTEGVYKV 60

Qy         61 SWTEPTGTDVSLNFMPNEKRMHGIIFFPKWVHEHPEITVCYQNDHIDLMKESREKYETYP 120
              ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
Db         61 SWTEPTGTDVSLNFMPNEKRMHGIIFFPKWVHEHPEITVCYQNDHIDLMKESREKYETYP 120

Qy        121 KYVVPEFAEITFLKNEGVDNEEVISKAPYEGMTDDIRAGRL 161
              |||||||||||||||||||||||||||||||||||||||||
Db        121 KYVVPEFAEITFLKNEGVDNEEVISKAPYEGMTDDIRAGRL 161


RESULT 2
Q8KNX7_9BACI
ID   Q8KNX7_9BACI   PRELIMINARY;   PRT;   161 AA.
AC   Q8KNX7;
DT   01-OCT-2002, integrated into UniProtKB/TrEMBL.
DT   01-OCT-2002, sequence version 1.
DT   07-FEB-2006, entry version 11.
DE   Phenolic acid decarboxylase.
GN   Name=padA;
OS   Bacillus sp. BP-7.
OC   Bacteria; Firmicutes; Bacillales; Bacillaceae; Bacillus.
OX   NCBI_TaxID=126733;
RN   [1]
RP   NUCLEOTIDE SEQUENCE.
RX   MEDLINE=22947447; PubMed=12819959; DOI=10.1007/s00253-003-1371-y;
RA   Prim N., Pastor F.I.J., Diaz P.;
RT   "Biochemical studies on cloned Bacillus sp. BP-7 phenolic acid
RT   decarboxylase PadA.";
RL   Appl. Microbiol. Biotechnol. 63:51-56(2003).
CC   ---------------------------------------------------------------------
CC   Copyrighted by the UniProt Consortium, see http://www.uniprot.org/terms
CC   Distributed under the Creative Commons Attribution-NoDerivs License
CC   ---------------------------------------------------------------------
DR   EMBL; AJ492219; CAD37333.1; -; Genomic_DNA.
```